

Title: Reformulation of Coal-Derived Transportation Fuels: Selective Oxidation of Carbon Monoxide on Metal Foam Catalysts

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Background. Coal-derived liquid transportation fuels must be reformulated in a series of catalytic steps to produce a hydrogen-rich gas stream for automotive fuel cells. This gas stream must have a very low (<10 ppm) concentration of CO to avoid poisoning the PEM fuel cell electrodes. A final selective oxidation step, in which the concentration of CO is reduced from 1.0% to less than 10 ppm in the presence of high concentrations of both H₂ and steam, is critical to the design of all fuel processors (Figure 1). An active, selective, and stable catalyst is required, as is a reactor design that meets the challenges of a modern automobile.

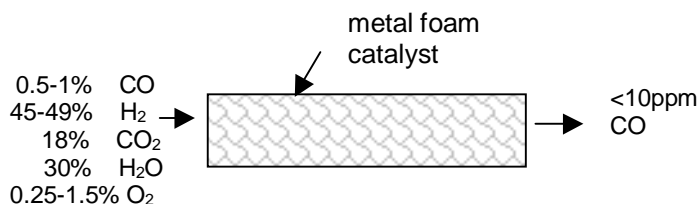


Figure 1. Selective oxidation of CO for fuel processing using a metal foam catalyst.

Progress/Plans. A series of Pt-based catalysts supported on a reticulated metallic foam have been synthesized. The metal foams used for this initial testing are 40 ppi (pores per inch) and have a metal loading of roughly 1.26 g Pt/in³. Using

conventional steady-state microreactor tests and isotopic switching experiments, we will study the selective oxidation of CO at temperatures from ~80-180 °C. In particular, we will focus on the effect of steam, which has not been included in most of the published studies on this reaction. Steam is a major component of the feed to the selective oxidation step, and is known to kinetically inhibit the reaction and to deactivate the catalyst.

Published journal articles, completed presentations, and students receiving aid.

- Published journal articles/completed presentations: none (grant awarded Sept. 2002)
- Students receiving aid: Paul Chin (NC State University, Arornmart Sirijaruphan, (Clemson University)